

**REGIONAL COMPETITION - ROUND 11**  
**TOSS-UP**

1. ASTR; Multiple Choice: The time required for the Moon to orbit the Earth and catch up with the Sun again is called a:
- a) synodic month
  - b) calendar month
  - c) sidereal month
  - d) celestial month

ANSWER: A--SYNODIC MONTH (A PERIOD OF 29.53 DAYS)

**BONUS**

1. ASTR; Multiple Choice: There are five points in the orbital plane of two bodies revolving about each other in circular orbits where a third object of negligible mass can remain in gravitational equilibrium. What are they called?
- a) librations
  - b) Roche limits
  - c) Lagrangian point
  - d) perigees

ANSWER: C--LAGRANGIAN POINTS

---

**TOSS-UP**

2. BIOL; Multiple Choice: In plant cells, photosynthesis takes place within which of the following organelles?
- a) mitochondria
  - b) nucleus
  - c) chloroplast
  - d) vacuoles

ANSWER: C--CHLOROPLAST

**BONUS**

2. BIOL; Multiple Choice: Which of the following is common to both respiration and photosynthesis?
- a) one of the end products is oxygen
  - b) ADP is converted to ATP
  - c) the reaction occurs within the inner membrane of the mitochondria
  - d) light energy is converted to chemical energy

ANSWER: B--ADP IS CONVERTED TO ATP

---

**TOSS-UP**

3. PHYS; Short Answer: Who received the Nobel Prize in Physics in 1923 for his experiment which measured the charge of the electron?

ANSWER: (ROBERT ANDREWS) MILLIKAN

**BONUS**

3. PHYS; Short Answer: Approximately how many seconds is the period of a simple pendulum of length equal 1 meter?

ANSWER: 2 (SECONDS)

---

**TOSS-UP**

4. CHEM; Short answer: Give the products of the hydrolysis of ethyl acetate.

ANSWER: ACETIC ACID AND ETHYL ALCOHOL (ACCEPT ETHANOL)( $\text{CH}_3\text{COOH}$ ,  $\text{C}_2\text{H}_5\text{OH}$ )

**BONUS**

4. CHEM; Short answer: What is the atomic mass of the lead atom that results from decay of uranium 238?

ANSWER: 206 or 206 DALTONS

---

### TOSS-UP

5. GENR; Multiple Choice: Which of the following is generally the largest user of energy in a home?
- a) lights
  - b) TV
  - c) water heater
  - d) cooking stove

ANSWER: C--WATER HEATER

### BONUS

5. GENR; Multiple Choice: Of all the oil in the United States that has ever been discovered, what is an estimate of the amount that has been left behind, trapped in porous formations and unable to be economically recovered, awaiting the development of new and more efficient oil removal technologies?
- a) 1/3
  - b) 2/3
  - c) 3/4
  - d) 9/10

ANSWER: B--2/3

---

### TOSS-UP

6. COMP; Multiple Choice: The ASCII value of Z (capital Z) is 90; that of lower case z is 122. What is the ASCII (ask-ee) value of Control-Z?
- a) 26
  - b) 154 (122 + 32)
  - c) 58 (90-32)
  - d) 186 (122 + 64)

ANSWER: A--26

### BONUS

6. COMP; Multiple Choice: On the standard keyboard, hitting the CONTROL key while hitting a letter key results in the processor receiving a byte with:
- a) a value 64 less than the ASCII value of the letter
  - b) a value 32 less than the ASCII value of the letter
  - c) a value 64 more than the ASCII value of the letter
  - d) the 3 most significant bits set to 0

ANSWER: D-- THE 3 MOST SIGNIFICANT BITS SET TO 0

---

**TOSS-UP**

7. CHEM; Short answer: Historically, what was the first organic compound to be synthesized from inorganic constituents?

ANSWER: UREA

**BONUS**

7. CHEM; Short answer: What was the chemical compound that Wohler heated in order to obtain urea?

ANSWER: AMMONIUM CYANATE or  $\text{NH}_4\text{CNO}$

---

**TOSS-UP**

8. BIOL; Short Answer: Angiosperms, also known as the flowering plants, are divided into two classes. Name the class which contains familiar plants such as grasses, palms, and orchids.

ANSWER: MONOCOTYLEDONS OR MONOCOTS

**BONUS**

8. BIOL; Multiple Choice: Which of the following distinguishes monocots from the other class?

- a) secondary of woody growth
- b) scattered vascular bundles
- c) veination is usually net-like
- d) xylem is present

ANSWER: B--SCATTERED VASCULAR BUNDLES

---

### TOSS-UP

9. PHYS; Multiple Choice: In 1987 a new class of superconducting materials were discovered that became superconducting at much higher temperatures than previously attainable. Recently, a compound of bismuth, strontium, calcium, copper and oxygen claimed a new record high temperature of:
- a) 77 degrees Kelvin
  - b) 100 degrees Kelvin
  - c) 150 degrees Kelvin
  - d) 250 degrees Kelvin

ANSWER: D--250 DEGREES KELVIN

### BONUS

9. PHYS; New prefixes have recently been chosen to represent  $10$  raised to the minus 21st power and  $10$  raised to the minus 24th power. Name either one.

ANSWER: ZEPTO (ACCEPT Z) AND YOCTO

---

### TOSS-UP

10. ERSC; Multiple Choice: A metal that does NOT occur native in the earth is:
- a) copper
  - b) gold
  - c) sodium
  - d) silver

ANSWER: C--SODIUM

### BONUS

10. ERSC; Multiple Choice: Which of the following minerals is a source of iron
- a) Bauxite (pron: box-ite)
  - b) Hematite (pron: he-ma-tite)
  - c) Malachite (pron: mal-ah-kite)
  - d) Galena (pron: ga-lee-nah)

ANSWER: B--HEMATITE

### TOSS-UP

11. BIOL; Multiple Choice: The mitral valve of the heart is also known as the:

- a) tricuspid valve
- b) aortic flap
- c) bicuspid valve
- d) bundle of Hiss

ANSWER: C--BICUSPID VALVE

### BONUS

11. BIOL; Short Answer: Where in the heart is the mitral valve located?

ANSWER: BETWEEN THE LEFT ATRIUM AND LEFT VENTRICLE (ACCEPT MIDDLE OF LEFT SIDE)

---

### TOSS-UP

12. PHYS; Multiple Choice: The top quark has not yet been discovered in high energy proton-antiproton collisions but scientists have pushed up their estimate of the minimum mass the top must have if indeed it exists. This is approximately:

- a) 10 Mev
- b) 10 GeV
- c) 100 Gev
- d) 1000 Gev

ANSWER: C--100 GEV

### BONUS

12. PHYS; Multiple Choice: Scientists have observed the first flavor-changing non-charge-changing decays of the "b" quark. The Feynman diagram for this rare event vaguely resembles which bird?

- a) crow
- b) penguin
- c) eagle
- d) ostrich

ANSWER: B--PENGUIN

---

### TOSS-UP

13. CHEM; Multiple Choice: When a substance evolves moisture upon exposure to the atmosphere the substance is said to be:
- a) deliquescent
  - b) hygroscopic
  - c) efflorescent
  - d) hydrophobic

ANSWER: C--EFFLORESCENT

### BONUS

13. CHEM; Short answer: List the following atoms in order of decreasing electronegativity:
- hydrogen, cesium, fluorine, nitrogen, magnesium

ANSWER: FLUORINE, NITROGEN, HYDROGEN, MAGNESIUM, CESIUM

---

### TOSS-UP

14. MATH; Short Answer: The sum of the infinite series  $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots =$

ANSWER: ONE (1)

### BONUS

14. MATH; Multiple Choice: If the sine function can be expressed in terms of exponential functions, what can the inverse sine function be expressed in terms of?
- a) cosine functions
  - b) natural logarithmic functions
  - c) the area of a triangle
  - d) the radius of a circle

ANSWER: B--NATURAL LOGARITHMIC FUNCTIONS

---



### TOSS-UP

15. GENR; Multiple Choice: The earliest experiments on chromosome theory and inheritance were developed by:
- a) Gregor Mendel
  - b) Jonas Salk
  - c) Charles Sternak
  - d) Robert Oppenheimer

ANSWER: A--(GREGOR) MENDEL

### BONUS

15. GENR; Multiple Choice: What thermodynamic cycle is used in jet engines?
- a) Stirling
  - b) Rankine
  - c) Otto
  - d) Brayton

ANSWER: A -- STIRLING

---

### TOSS-UP

- 16 BIOL; Multiple Choice: A neutral fat hydrolyzes to give:
- a) one glucose molecule and three hydroxyl molecules
  - b) one glycerol molecule and three fatty acid molecules
  - c) one lactate molecule and three fatty acid molecules
  - d) one glucose molecule and three pyruvate molecules

ANSWER: B--ONE GLYCEROL MOLECULE AND THREE FATTY ACID MOLECULES

### BONUS

16. BIOL; Short Answer: Starch, glycogen, and cellulose are all examples of:

ANSWER: POLYMERS OF GLUCOSE MOLECULES (POLYSACCHARIDES)

---

**TOSS-UP**

17. ASTR; Multiple Choice: A solar eclipse will always occur when:

- a) the Moon and Sun are at nodes at the same time
- b) the Earth passes directly between the Sun and the Moon
- c) the Moon is full and Sun at a node
- d) the Moon is new and Sun not at a node

ANSWER: A--THE MOON AND SUN ARE AT NODES AT THE SAME TIME

**BONUS**

17. ASTR; Multiple Choice: The longest total solar eclipse possible is:

- a) 10 minutes 10 seconds
- b) 5 minutes 37 seconds
- c) 7 minutes 31 seconds
- d) 3 minutes 43 seconds

ANSWER: C--7 MINUTES 31 SECONDS

---

**TOSS-UP**

18. PHYS; Multiple Choice: The Standard Model, consisting of quarks and leptons interacting via force-carrying bosons, is not the first theory of everything. A Berkeley historian describes a model from about 1800 which sought to make physics more like astronomy and was based on the work of Coulomb, LaPlace, Poisson, Ampere and others. The name of this model was:

- a) the Napoleonic standard model
- b) the Faraday model
- c) the Franklin standard model
- d) the Galileo model

ANSWER: A--THE NAPOLEONIC STANDARD MODEL

**BONUS**

18. PHYS; Multiple Choice: For a given camera, as the aperture is made smaller, the depth of field

- a) becomes greater
- b) becomes smaller
- c) does not change
- d) depends upon shutter speed

ANSWER: A -- BECOMES GREATER

---

**TOSS-UP**

19. CHEM; Multiple Choice: The pH of a solution is defined as:
- a) the inverse of the hydrogen ion concentration
  - b) the negative logarithm of the hydrogen ion concentration
  - c) the positive logarithm of the hydrogen ion concentration
  - d) the logarithm of the molarity of the solution

ANSWER: B--THE NEGATIVE LOGARITHM OF THE HYDROGEN ION CONCENTRATION

**BONUS**

19. CHEM; Short answer: A solution is made by dissolving 0.365 grams of hydrogen chloride in 100 liters of water. What is the pH of this solution?

ANSWER: FOUR (4)

---

**TOSS-UP**

20. ERSC; Multiple Choice: What physical characteristics are the two main dinosaur groups classified by?
- a) neck vertebrae
  - b) teeth
  - c) pelvic bones
  - d) digestive system

ANSWER: C--PELVIC BONES

**BONUS**

20. ERSC; Short Answer: Name the two main groups of dinosaurs.

ANSWER: SAURISCHIAN (SAWR-IS-KEY-UN), ("REPTILE-HIPPED") AND ORNITHISCHIAN (ORN-ITH-IS-KEY-UN), ("BIRD-HIPPED")

---

**TOSS-UP**

21. COMP; Multiple Choice: A full-adder is distinct from a half-adder in that it can
- a) complete an addition in a single step
  - b) add 2 binary digits and handle carry-over
  - c) add any number of binary digits
  - d) add either seven- or eight-bit bytes

ANSWER: B--ADD 2 BINARY DIGITS AND HANDLE CARRY-OVER

**BONUS**

21. COMP; Multiple Choice: All CPU operations can be reduced to:
- a) processing and I-O functions
  - b) adding and comparing
  - c) calculating and reporting
  - d) 3 basic logical operations

ANSWER: B--ADDING AND COMPARING

---

**TOSS-UP**

22. BIOL; Multiple Choice: The fluid mosaic model of membrane structure suggests that protein molecules drift about with a bilayer. This bilayer is composed of:
- a) polysaccharides
  - b) proteins
  - c) lipids
  - d) covalently bonded peptides

ANSWER: C--LIPIDS

**BONUS**

22. BIOL; Short Answer: Vesicles derived from endoplasmic reticulum make their way to an organelle that functions in packaging and secretion called the:

ANSWER: GOLGI BODY

---

**TOSS-UP**

23. MATH; Multiple Choice: The sum of the infinite series  $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \dots =$
- a) 1
  - b) 2
  - c) 3
  - d) infinity

ANSWER: D--INFINITY

**BONUS**

23. MATH; Short Answer: The slope of the straight line through the points (-3,7) and(3,7) is:

ANSWER: ZERO (0)

---

**TOSS-UP**

24. PHYS; Multiple Choice: As you walk toward a large convex mirror, your image:
- a) becomes smaller
  - b) stays the same size
  - c) becomes larger
  - d) depends upon the material from which the mirror is constructed

ANSWER: C--BECOMES LARGER

**BONUS**

24. PHYS; Multiple Choice: Currently, one of the leading candidates for a Unified Field Theory is:
- a) General Relativity
  - b) Quantum Field Theory
  - c) String Theory
  - d) Quark Theory

ANSWER: C--STRING THEORY

---

### TOSS-UP

25. CHEM; Multiple Choice: The tetrahedral bond angle is approximately

- a) 90
- b) 190
- c) 109.5
- d) 120

ANSWER: C--109.5

### BONUS

25. CHEM; Multiple Choice: When a chemical reaction is at equilibrium, the free energy ( $\Delta G$ ) for the reacting system is:

- a) less than zero
- b) greater than zero
- c) equal to zero
- d) decreasing

ANSWER: C--EQUAL TO ZERO

---